SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY

President: J. ANGELL JAMES, M.D., M.R.C.P., F.R.C.S.

March 1st, 1957

Treatment of Choanal Atresia

THE opening paper by Mr. C. P. Wilson will be found on p. 616.

Discussion

MR. S. W. G. HARGROVE, in discussing Mr. Wilson's paper, said he had learned a great deal from what Mr. Wilson had described to-day on how he has dealt with a case of unilateral choanal atresia. He had had a case of bilateral choanal atresia in a small boy whom he had seen from birth. He found it difficult to decide at what age to perform the operation.

At 3 weeks old he probed the posterior choanae and made a small hole on the left side only, but was unable to enlarge this to any considerable size. This enabled the child to be suckled and during the first year of life it was with great difficulty that the child was kept alive. At 15 months he performed the operation using the approach as described by Mr. Wilson and removed the whole of the vomer, which was causing the bony obstruction. The centre of the obstruction was membranous and thickened and this was also removed. No packing or dilators were placed in the posterior choanae at the time of the operation, as the passages appeared to be adequate in size, but within a period of two months the whole of the area had scarred and was practically closed. The scar tissue was removed and two large rubber catheters placed through the anterior nares into the posterior choanae and left in position, and using this method the posterior choanae had remained patent.

He felt sure that what Mr. Wilson had described was the right thing to do and it is the prevention of the scar tissue which is the essential part of the operation.

He would like to ask him what would he consider the optimum age at which the operation should be performed. He felt that we owe him a debt of gratitude for the work he has done on the approach to the post-nasal space and felt that we should call it "Wilson's approach", as it is due to his endeavours to popularize this approach to the Post Nasal Space that we are now using this operation for choanal atresia and other lesions in the region.

MR. H. D. BROWN KELLY said that he had had the pleasure of watching Mr. Wilson operate. Those who, in the past, had tried to deal with these cases

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through the nose realized what a difficult and very unsatisfactory procedure it was and how it had now been replaced by a very ingenious and scientific operation.

He would like to ask Mr. Wilson whether he found the thickest bone at the edge of the occluding plate. In his experience, which had not been very great, he found that the central point of the choanal occlusion was quite thin and easily perforated, whereas round the periphery it was extremely thick, not only on the septum, but also on the floor of the nose and lateral wall.

The thickness of the bone was very forcibly brought home to him a good number of years ago by the case of a young man with choanal atresia. The surgeon operating through the nose, managed to get a hole through the occlusion and decided to enlarge it with a chisel. Unfortunately the patient died from meningitis, presumably due to a cribriform plate fracture.

MR. A. G. GIBB said that the first time he encountered a case of congenital choanal atresia was some years ago when he was called to the Midwifery Department to see an infant 2 days old with severe respiratory obstruction. The pædiatrician's diagnosis of bilateral choanal atresia was correct. Together with his colleagues, he felt that any surgical interference would be attended by grave risk, but it became apparent that if nothing was done, the infant would die. He first tried putting a rubber tube into the mouth; the infant breathed well with this for a day, but it became obvious that if this means of relief was continued for long, pharyngeal ulceration would result. He, therefore, passed two No. 4 Eustachian catheters through the choanal obstruction—a procedure which resulted in marked shock with cessation of breathing and the infant very nearly died. After that the infant picked up a good deal and he made a special tube constructed of metal with the same curve as a Eustachian catheter, but of slightly wider bore; the tube was covered with acrylic because it became obvious that it would have to stay in for some time. The infant continued well for over three months treated in this fashion.

In the meantime he thought over the question of operative procedures—this was prior to Mr. Wilson's original description of his palatal approach. Looking through the literature he came on the Ruddy incision and decided to approach the choanal obstruction by that method. Difficulty was experienced in deciding the optimum time for operation, the operation being delayed on account of the unwillingness of the anæsthetist to risk a general anæsthetic. However at 6 months the baby's weight became absolutely stationary and for two or three weeks there was no further gain in weight. Following operation there was a progressive gain in weight which was quite striking. This particular infant was now 6 years old and thriving.

From the operative point of view there were several points which he felt were important: Firstly he started off with a Ruddy incision, but found that in this case the incision was too far back and he had to increase the exposure forwards by making a further incision anteriorly in the midline of the palate, thus making a "Y" type of incision as described by Mr. Wilson. He did not agree with that incision as he felt there was a weak spot where the three limbs of the "Y" joined and while it might be satisfactory where all the mucous membrane of the nose was carefully preserved—and Mr. Wilson stressed this point—where there was

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considerable loss of mucous membrane as in this case he felt that this weak spot could lead to trouble. He felt that a "U" shaped type of incision made closer to the incisor teeth was ideal. Secondly he felt it important to realize that in these choanal obstructions the obstructing tissue might extend forward from the choana for a considerable distance as it did in this child for 1 centimetre.

He had since operated on a unilateral case of a child of three, but she required a skin graft to cover the raw area.

He was most interested to know Mr. Wilson's ingenious method of using the mucosal flaps to the greatest advantage. He himself had found it extremely difficult to use all the mucosa and also to leave no raw areas. He felt that these details which Mr. Wilson had given would be of much help in further cases.

MR. WILSON, in reply, said that Mr. Hargrove raised the question of what was the best time to operate. If the atresia was unilateral there could not be any urgency about operation. The main disability, apart from the nasal obstruction on one side, was that the child had a dirty nose. There were many children with dirty noses and he thought one was entitled to wait until the child became of school age. The disadvantage was rather greater if the patient was avoided by other children because it always had mucus running down its upper lip. With a unilateral case he thought the ideal age was some time after the age of 5.

With a bilateral case he thought there were two distinct types. There was the acute type in which the patient might die of dysphagia or exhaustion or dehydration unless something was done pretty quickly. It was hopeless to think at that stage of doing a complicated operation on a child already in a very poor condition and only a day or two old. One had to temporize in whatever way one felt best. He did not know whether in these cases it was more likely that the condition was membranous or bony; one hoped it would be membranous and he thought Mr. Brown Kelly's suggestion of putting in a curved metal canula to tide the child over for some months until something a little more drastic could be done was probably as useful a suggestion as any he had heard. It was the type of case where one had to do whatever one felt was likely to help most.

The other type seemed to be reasonably symptomless except that they also had dirty noses; they were mouth breathers and had learned to breathe through their mouths very quickly after birth: it was only because they did so that they could go on living. If they became mouth-breathers it ceased to be a question of urgency and they should not be operated on until the operation was less difficult.

Mr. Brown Kelly asked where the bone was thickest; he presumed at the edges, and the bone would be thinnest at the centre. He thought Mr. O. C. Lord knew more about that than he did because he had looked up the records of a large number of cases and as far as he remembered from Mr. Lord's article in quite a large proportion of cases the centre of the atresia was membranous; that was a matter which might make the operation difficult; if there was a membranous partition in the middle one had to damage one mucous membrane area, either anterior or posterior to the atresia. He thought the posterior surface would be most easily preserved so that would seem to be the best area to get and use it to cover the lateral wall where the bone was at its thickest, but it would mean that there would be a hole in the mucous membrane flap forming the anterior

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surface of the atresia. It might be that the deficiency in the mucous membrane could be obliterated by making the septal incision a little farther forward.

Mr. Gibb talked about the incision and he absolutely agreed with him. He did not like triradiate incisions, the only thing was that in his first case, using his own original incision, he had to enlarge it by a midline addition because he could not elevate the mucous membrane of the hard palate sufficiently far forward without doing so. He then tried what one might call the Ruddy incision, he was not quite happy with that, and eventually decided on this "tri-partite" one. He did not know what the answer was, but thought the incision a matter of individual preference.

NORTH OF ENGLAND OTOLARYNGOLOGICAL SOCIETY

THE twenty-ninth meeting of the North of England Otolaryngological Society was held at the Victoria Hospital, Blackpool, on Saturday, March 23rd, 1957, with the President, Mr. Guy Thompson, of Scarborough, in the Chair.

Clinical Cases

Twenty-four patients (35 ears) were presented by Mr. I. B. Thorburn and Mr. A. Finlay Brown illustrating results in Wullstein Tympanoplasties, Types 1 to 5 with special emphasis on Type 3 (18 ears). Some fenestration operations were also included to show a variety of uses of full thickness skin grafts. Other cases presented included seven patients showing early results of mobilization of the stapes, one case of Arnold's Nerve Syndrome and various nasal plastic and laryngeal and pharyngeal cancer problems.

Miniature Cine Film

Before the discussion a miniature cine film was shown by Mr. Finlay Brown. This film illustrated the manner in which some of the difficulties of cine-photomicrography could be overcome and how ear operations could be photographed in colour using the photographic attachment to the Zeiss microscope with a home made supplementary lens system and the standard microscope lighting. The film, accompanied by a sound commentary, showed a postaural fenestration operation and an endaural modified radical mastoid operation for attic cholesteatoma. Rosen's technique for mobilization of the stapes was filmed on a cadaver through an aural speculum. The steps in this operation were well seen, the round window reflex and the movement of the stapedius tendon were clearly demonstrated.

There followed a series of laryngeal studies including the follow-up pictures over 18 months of intrinsic and extrinsic cancer of the larynx.

The President said that after seeing the film one could have no doubt as to the value of the miniature camera in this type of work.

DR. LOUIS VERHŒVEN (Antwerp) congratulated Mr. Finlay Brown on his achievement and thanked him for making this kind of work so simple and so inexpensive. He considered that this film compared favourably in definition and colour value with those made by others using very expensive equipment.

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Members showed great interest in the compact apparatus. Mr. Finlay Brown said that the film was the result of experiments over the past year.

Discussion

(1) *The behaviour of full thickness skin grafts in the ear*

MR. THORBURN said that his technique with full thickness skin grafts was not yet standardized. When he began to perform tympanoplasty operations over two years ago he felt that he wanted to gather experience of the behaviour of full thickness skin. He used it in a series of fenestration cavities to supplement the tympanomeatal flap, but he had trouble with granulations and plastic revision operations were required in many cases.

In tympanoplasties the extraordinary fact soon emerged that skin used to reconstruct the tympanum generally behaved very well, whereas the same skin applied in the mastoid cavity often broke down and acted like a foreign body causing granulations and discharging freely; or after good immediate healing the cavity might later relapse into an unstable moist granulating state. At first he used quite large skin grafts; later he cut them up into smaller grafts as a crazy paving with improved healing.

A return visit to Wullstein suggested once more the use of bigger grafts giving a complete cover to the mastoid cavity. Again they did not behave and now he employs a meatal skin flap supplemented by *very small* pieces of skin in the form of a well spaced crazy paving. The behaviour of these small grafts is good; if one or two die they come away and the space is epithelialized from a nearby viable graft.

He had during the last six months performed nine Wullstein type fenestration operations conserving intact the drum, the ossicular chain and a protective "bridge" of bone. The fenestra and mastoid were covered with full thickness skin. These skin grafts have generally taken well but have remained in a peculiarly moist unstable state. In the first few months the cavities do not compare well with those of the Lempert type fenestrations but more time is needed to assess the long term results.

MR. BEALES (Doncaster) said he had very little trouble with skin grafts used in myringoplasties. He agreed that in tympanoplasties there was difficulty with grafts applied to the mastoid cavity and he had given them up using only split thickness skin to reconstruct the tympanic cavity. Here the skin stayed as skin, and he had even seen hair growing from it months later.

He presented slides showing the histology in a case of tympanoplasty submitted to a revision operation six months later because of residual tympanic disease. Skin from the tympanum retained all the characteristics of normal skin and mucous membrane could be seen partly lining the skin graft. Skin from the mastoid, however, was atrophic and had lost the specialized structures. This showed that skin in these two places behaved quite differently.

With regard to the question of what to do with the mastoid cavity he was very impressed with the satisfactory cavities shown to-day and probably Mr. Thorburn's small grafts were the answer. He thought a pedicled meatal skin flap should be used since, with its blood supply, it should survive as normal skin.

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MR. WISHART (Blackburn) stated that he liked to use Thiersch grafts to line the mastoid. He thought that they took well and did not granulate. He had often successfully used a Thiersch graft in place of a tympanomeatal flap in fenestration operations.

MR. BAUER (Liverpool) referred to an article by K. Burian in the *Monatsschrift für Ohrenheilkunde und Laryngologie* (**89**, 1955, 21, 24 and 71) in which he showed that skin grafts in the mastoid do not survive as such, but they provide a temporary scaffolding under which epithelium grows slowly from the peripheral normal skin.

MR. GRAY (Sheffield) considered that the moist granulating state of some of these mastoid cavities was due to replacement of the skin graft by mucous membrane growing beneath and ultimately replacing the graft. MR. THORBURN considered this unlikely in his cases as he went to considerable pains to eradicate mucosa from the mastoid.

MR. ROWE (Barnsley) asked why postaural skin was preferred.

MR. THORBURN understood that postaural skin contained less elastic fibres than available skin elsewhere. Besides it was very convenient; taking sufficient skin to make the tympanoplastic repair plus the crazy paving left no unsightly scar behind the ear. He certainly found the skin surprisingly easy to manipulate and fit to the various contours of the meatus, tympanum and mastoid.

MR. MACKENZIE (London) remarked that he had used tattooed skin as a graft in the mastoid and found that the tattoing survived indicating that the skin was not discarded completely.

MR. BAUER also raised the question of using skin from skin banks.

Replying to the discussion MR. THORBURN said that he had been trying to investigate the behaviour of full thickness skin grafted in the mastoid. He believed that the small grafts behaved better because they provide a nidus of epithelium from which outgrowth occurs. He had previously used Thiersch grafts, but did not like the resulting large cavities covered by unstable desquamating epithelium. Pedicled meatal skin flaps were of value, but unaided they leave a big area to epithelialize especially in the roof of the mastoid. He believed that the further epithelium had to grow the more unstable it became; hence the value of supplementary skin grafting.

(2) *Wullstein Tympanoplasty, Type 3*

To promote understanding and discussion of the tympanoplasty cases shown, Mr. Thorburn presented the following notes on the five types of tympanoplasty described by Wullstein.

Tympanoplasty requires the acceptance of certain fundamental adjustments in our traditional concepts relating to the surgical management of active or healed chronic otitis media. It does not entirely displace the modified radical

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or radical mastoid operation—rather does it offer a way of understanding and imitating the good results often obtained by such operations or by nature without surgery. Tympanoplasty is evolving out of improvements of technique in the surgery of the temporal bone, thanks especially to the precision made possible by the use of a good operating microscope. This permits the surgical application of the basic audiological principles of leverage and phase differential which determine the transmission of sound waves to the labyrinth. One has to try to eliminate the disease and then to reconstruct a functioning tympanum with what is left. Full thickness skin grafts are used in this reconstruction of the drum and for lining the mastoid cavity. These are conveniently taken from behind the pinna and must be thinned down and stripped of all subcutaneous tissue. The control of infection and the viability of the skin grafts is assisted by appropriate antibiotic therapy. The future new tympanic cavity is usually filled with absorbent gelatine sponge to prevent its obliteration in the early stages of healing and to support the graft in position. Within a few weeks this material is resolved into the blood stream or escapes down the Eustachian tube. Although five types of tympanoplasty are described by Wullstein, these are not clear cut and each case presents an individual problem.

Pre-requisites for Tympanoplasty

(i) Good tubal function without chronic tubal infection.
(ii) Adequate cochlear function.
(iii) Preservation or improvement of hearing is a useful and worthwhile objective.
(iv) The otologist having accepted the underlying principles must become skilled in the technique of micro-surgery of the ear.

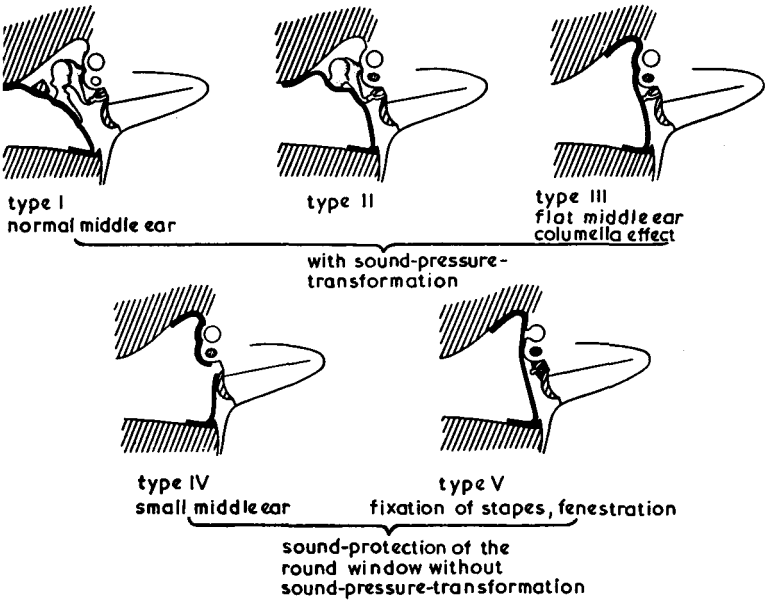
He should:

(*a*) Assess and eliminate irreversible pathology, e.g., osteitis, granulations, cholesteatoma or keratinizing epithelium, from the tympanic cavity and mastoid.
(*b*) Assess and respect reversible mucosal pathology so that a mucous membrane covering is retained over the medial tympanic wall.
(*c*) Test the functional integrity of the ossicles and of the oval and round windows.
(*d*) Prepare a bed for the full thickness skin graft used to create a new drum by stripping away the outer epithelial layer from the remains of the drum and the skin from the adjacent meatal wall.
(*e*) Achieve a relatively bloodless operation field.

MR. MCGUCKIN (Newcastle-upon-Tyne) stated that conversion of the human ossicular chain to that of a bird can produce excellent results and the improved hearing level can be better than after a fenestration operation for otosclerosis. He quoted two such cases in one of which the new drum became so transparent that one could see the niche of the round window through it. The choice of operation must be related to the available material. It is no good covering up disease; unless the disease is excised and there is some chance that the tympanic membrane will regenerate, a tympanoplasty operation should not be completed.

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There is no justification for performing a tympanoplasty at the expense of the patient's safety.



Wullstein's diagram showing five types of Tympanoplasty.

FIG. 1.

Types 1, 2 and 3 all retain sound pressure transformation by leverage through the ossicles. Type 1 has an intact ossicle chain protected by a bridge of bone. Type 2 has no bridge and there may be slight erosion of the ossicles. Type 3 has reduced leverage as there is no malleus or incus the drum being in contact with the stapes. This is equivalent to the columellar hearing found in birds. These three types also have sound protection or a baffle over the round window; this is usually provided by using a skin graft to close the tympanum. Type 4 has no leverage, there being only the mobile footplate of the stapes. All that one can do here is to provide sound protection to the round window by a skin graft creating a small middle ear in functional continuity with the Eustachian tube. In Type 5 there is fixation of the stapes, usually by otosclerosis. One provides sound protection or a baffle over the round window by making a closed tympanum and at the same time, or at a later date, carrying out a fenestration of the lateral semicircular canal.

MR. BEALES referred to cases where extensive excision of disease was necessary and thought there was a place for a two-stage operation. Under antibiotic treatment the mucosa could regenerate in two to three weeks. A graft could then be safely and successfully applied in cases which had initially appeared hopeless.

MR. MACKENZIE asked what Mr. McGuckin meant by "at the expense of the patient's safety". Mr. McGuckin said that he referred especially to the inclusion of cholesteatoma within the new tympanic cavity and the consequent danger of erosion of the labyrinth.

MR. GAVIN LIVINGSTONE (Oxford) thought that the Type 3 operation would prove to be the most successful as it gave good access to disease, combined with functional reconstruction.

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3. Mobilization of the Stapes.

MR. FINLAY BROWN said that the permeatal approach presented no great difficulty to anyone familiar with Tumarkin's technique. He used the microscope throughout the operation and thought that cadaver work had helped to make him familiar with the feel of the normal stapes. The mechanics of the operation did not appear to be fully understood and it was as yet impossible to predict the result in any individual case. Nor could the condition of the stapes be foreseen. Its fragility varied widely; in some cases the crura broke even on light pressure over the incudo-stapedial joint when testing for fixation; in others it withstood a considerable amount of leverage. If the stapes is apparently mobilized and yet there is no commensurate rise in the hearing, one must inspect the crura and footplate under greater magnification, and, if the crura are fractured, either fracture the footplate behind the anterior crus, or if this is not possible fenestrate the footplate itself as recently described by Rosen.

The cases shown illustrated the very good results obtainable and in the failures the hearing was no worse than before the operation.

MR. GILL (Manchester) mentioned that Fowler's experiments (1956) showed that the only way to ensure a reasonably high proportion of results was to snap the footplate behind the anterior crus and then to snap the anterior crus and that this finding had tended to be borne out by his own results.

MR. VENTERS (Carlisle) said that with experience of over 90 cases he had not the slightest doubt that the operation was a most satisfactory one in a reasonable percentage of cases. He was sceptical at first but is now convinced of its value. He had carried out the Rosen technique; in addition he exerted lateral pressure on the crura when mobilization was difficult. Where the crura have been broken the operation has been unsuccessful.

If he failed on one side he did not attempt the other and likewise a good result on one side was usually followed by a similar result on the other. Thirty-eight per cent. of his cases were successful and these results were very good indeed. In some of these successful cases the hearing had been maintained for 18 months so far.

REFERENCE

BASEK, M., and FOWLER, JNR., E. P. (1956) Anatomical factors in stapes mobilization operation, *A.M.A. Arch. Otolaryng.*, **63,** 587. June.

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